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(19) (CA) **APPLICATION FOR CANADIAN PATENT** (12)

(54) Arrangement for Reusing Gray Water

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ABSTRACT OF THE DISCLOSURE

An arrangement for sensing gray water in which a bathtub, shower stall, self-contained toilet bowl or the like is constructed with respective false bottom gray
5 water collecting tanks. The gray water collected in the collecting tanks is conducted to a flush tank for flushing a toilet bowl. A pump responsive to the level of the water in the flush tank is operated for conducting gray water into the flush tank. Rain water advancing through
10 downspouts may also be stored in the collecting tanks as gray water.

The bath tub, the shower stall and the self-contained toilet bowl are self-contained units which can be employed respectively or in combination with one or more of the
15 described units.

BACKGROUND OF THE INVENTION

The present invention relates in general to systems for the conservation of water by building occupants, and more particularly to an arrangement for the conservation
5 of water by building occupants reusing gray water.

During the periods of water shortage, it becomes necessary for occupants of buildings to conserve water by reusing gray water. Various systems have been designed for this purpose. However, such systems require elaborate
10 and expensive plumbing installations.

In the U.S. patent to McCormick, No. 4,162,218, issued on July 24, 1979, for Water Reuse System, there is disclosed a gray water holding tank in which gray water is supplied from tubs, showers and bathroom sinks. Gray
15 water is transferred, upon demand, from the gray water holding tank to a toilet tank for reuse.

The U.S. patent to Aleman, No. 4,030,144, issued on June 21, 1977, for Apparatus And Arrangement For Conserving Water For Toilet Flushing, discloses apparatus
20 for conserving water in which water that has been used for washing in a wash basin is drained therefrom. The drained water is discharged into the tank of a flush toilet.

The U.S. patent to Toms, No. 4,197,597, issued on April 15, 1980, for Water Recycling With Solids And Foam Removal, discloses a system in which gray water from
25 lavatory sinks and showers and also rain water is conducted to a storage reservoir. The water accumulating in the storage reservoir is used for the operation of water closets of toilets.

30 In the U.S. patent to Call, No. 3,112,497, issued on December 3, 1963, for Water Conservation System, there is disclosed a system for conducting gray water from a

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bathtub and shower into a small receiver tank. From the small receiver tank, the gray water is redistributed to a large receiver tank. The gray water stored in the large receiver tank is supplied to the flush tank of a toilet to be reused for flushing the toilet.

In the U.S. patent to Reid, No. 3,594,825, issued on July 27, 1971, for Water Circulation System, there is disclosed a water circulation system for a camping trailer or boat. The trailer or boat includes a water flush toilet. Drain water from the wash basin or shower is directed to the inlet of the toilet tank. When the shower and wash basin are used, water flows through a drain outlet and drain conduit into a collecting tank below the shower.

The U.S. patent to O'Brien et al., No. 3,183,525, issued on May 18, 1965, for Method And Means For Operating A Toilet In A Fallout Shelter, discloses an arrangement in which water from a shower and a wash basin is drained into a waste water container. The waste water stored in the water waste container is received by a toilet tank for flushing the toilet bowl.

SUMMARY OF THE INVENTION

An object of the present invention is to provide an arrangement for the conservation of water by reusing gray water drained from bathtubs, shower stalls, wash basins, and the like to flush toilet bowls or the like without requiring elaborate and expensive plumbing installations.

Another object of the present invention is to construct bathtubs, shower stalls, wash basins or the like with integrally formed gray water storage receptacles or

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compartments for the refilling of toilet tanks used in the flushing of toilet bowls.

5 A feature of the present invention is to provide a bathtub with an integrally formed false bottom in which gray water is collected for reusing gray water to flush a toilet bowl.

10 Another feature of the present invention is to provide an integrally formed shower stall with a false bottom in which gray water is collected for reusing gray water to flush a toilet bowl.

15 An arrangement for reusing gray water in which a bathtub, shower stall, wash basin or the like is constructed with an integrally formed false bottom to collect gray water. The gray water collected in the false bottoms is conducted to a toilet tank for flushing a toilet bowl.

20 Another object of the present invention is to install a bathtub in a building with an integrally formed false bottom, or a shower stall in a building with an integrally formed false bottom, or a wash basin in a building with an integrally formed false bottom, and through a simple and direct conduit arrangement conduct the gray water collected in one or more false bottoms to the toilet flush tank or toilet closet for flushing a toilet bowl.

25 Another object of the present invention is to provide a self-contained toilet bowl with a flush tank capable of using gray water, which flush tank is disposed adjacent to and laterally from the toilet bowl and below the top wall of the toilet bowl.

30 Another object of the present invention is to provide a gray water system in which the bathtub has a false bottom gray water storage receptacle, the shower stall has a false bottom gray water storage receptacle, and the

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toilet bowl is a self-contained unit with a flush tank for gray water adjacent to and below the top of the toilet bowl. Each of the aforesaid units are self-contained in that they may be employed respectively or in combination
5 with one or more of the aforesaid units.

DESCRIPTION OF THE DRAWINGS

Figure 1 is a fragmentary diagrammatic illustration of
10 an arrangement for reusing gray water embodying the present invention.

Figure 2 is a diagrammatic illustration of an arrangement for reusing gray water including rain water embodying the present invention, which is a modification
15 of the arrangement for reusing gray water shown in Figure 1.

Figure 3 is a fragmentary diagrammatic illustration of a modified arrangement for reusing gray water in which the toilet flush tank is disposed adjacent to and laterally
20 from the toilet bowl.

Figure 4 is a fragmentary diagrammatic illustration of a still further modification of an arrangement for reusing gray water in which a gray water storage tank is disposed below the toilet bowl.

Figure 5 is a diagrammatic front elevation view of a foot pedal assembly used in connection with the arrangement shown in Figure 3.
25

Figure 6 is a diagrammatic side elevational view of the foot pedal assembly shown in Figure 6.

Figure 7 is a diagrammatic front elevational view of a flush handle assembly used in connection with the arrangement shown in Figure 4.
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DESCRIPTION OF THE PREFERRED EMBODIMENTS

Illustrated in Figure 1 is an arrangement 10 for reusing gray water embodying the present invention. The term "gray water" as herein employed means water that has been used for showering, bathing, and/or washing in a wash basin or the like. The term "gray water" as herein employed may also mean rain water collected from gutters, downspouts or the like.

The arrangement 10 comprises a shower stall 15, which includes a conventional shower stall section 15a. Below the conventional shower stall section 15a is a false bottom 15b which serves as a collecting compartment or receptacle for gray water draining out of the conventional shower stall section 15a. In the preferred embodiment, the false bottom collecting compartment 15b is integrally formed with the conventional shower stall section 15a. It is contemplated that the shower stall 15 may be prefabricated. In a bottom wall 15c of the conventional shower stall section 15a is a conventional drain 16 for discharging gray water from the conventional shower stall section 15a into the false bottom collecting compartment 15b. A building floor F is disposed generally at even height with the bottom wall 15c to conceal the false bottom collecting compartment 15b from view by the user of the shower stall 15.

It is contemplated that the shower stall 15 may be made from suitable metals, polyvinyl chloride or suitable plastics.

At the bottom of the false bottom collecting compartment 15b is an outlet opening 17 through which gray water flows from the false bottom collecting compartment 15b to a toilet flush tank or water closet 20 via a conduit 21 and a conduit 22. A conventional water level shut-off mechanism 23 with a float 23a and a shut-off valve 23b is also disposed within the flush tank 20. A flush tank 20 may be

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disposed at various convenient locations. For example, in Figure 3, the flush tank is disposed adjacent the toilet bowl at a level below the conventional location of well-known toilet flush tanks. Disposed along the conduit 5 21 is a one-way check valve 25, which serves to enable gray water to flow toward the toilet flush tank 20, but prevents gray water from backing-up into the false bottom collecting compartment 15b.

Also disposed along the conduit 21 in the vicinity of 10 the outlet opening 17 is a shut-off valve 26. The shut-off valve 26, when closed, interrupts the flow of gray water from the false bottom collecting compartment 15b through the conduit 21. Conversely, when the shut-off valve 26 is opened, gray water from the false bottom 15 collecting compartment 15b can flow from the false bottom collecting compartment 15b through the conduit 21.

Communicating with the conduit 21 and the flush tank 20 is a suitable self-priming automatic marine/RV potable water supply pump 30, which serves, when operated, to pump 20 gray water under pressure from the false bottom collecting compartment 15b to the toilet flush tank 20 over the following path: conduit 21, opened shut-off valve 26, check valve 25 and conduit 22. The operation of the pump 30 is controlled by water pressure or the pressure head of 25 the water in the conduit 22. When the water in the flush tank 20 is below a predetermined level, such as a pressure head of 20 p.s.i. in the conduit 22, the pump 30 operates to pump the gray water from the collecting compartment 15b into the flush tank 20. When the water in the flush tank 30 20 is above a predetermined level, such as a pressure head of 30 p.s.i. in the conduit 22, operation of the pump 30 is interrupted. The gray water in the flush tank 20 is

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used to flush a conventional toilet bowl 40 under the control of a conventional manually operated flush mechanism 20a. In the exemplary embodiment, the pump 30 is a well-known, self-prime, automatic marine/RV potable water supply pump manufactured by Flojet as Model No. 2P366. When the water pressure in the conduit 22 drops to 20 p.s.i., a built-in pressure switch automatically turns the pump on and when the water pressure in the conduit 22 reaches 30 p.s.i., the built-in pressure switch automatically interrupts the operation of the pump 30.

In the event the water level of the gray water in the false bottom collecting compartment 15b is above a predetermined level, the excess gray water is discharged into a sewer drain pipe 41 through a conduit 42. Should it be desired to discharge the gray water in the false bottom collecting compartment 15b directly into the sewer drain pipe 41, a suitable drain 43 and drain valve 44 are provided. The drain valve 44 communicates with the sewer drain pipe 41 through an elbow conduit 45. The drain 43, the drain valve 44 and the elbow 45 provide a convenient clean-out arrangement for cleaning the compartment 15b.

The arrangement 10 comprises a bathtub 50, which includes a conventional bathtub section 50a. Integrally formed with the bathtub section 50a as part of the bathtub 50 is a false bottom 50b, which serves as a collecting compartment or receptacle for the gray water draining out of the conventional bathtub section 50a. In the preferred embodiment, the false bottom collecting compartment 50b is a unitary structure with the conventional bathtub section 50a disposed therebelow and contiguous therewith. At the bottom wall 50c of the conventional bathtub section 50a is a conventional drain 51 for discharging, when opened, gray water from the conventional bathtub section 50a into the

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false bottom collecting compartment 50b. In the preferred embodiment, the building floor F is disposed generally at even height with the bottom wall 50c to conceal the false bottom collecting compartment 50b from view by the user of the bathtub 50.

It is contemplated that the bathtub 50 may be made of porcelain, polyvinyl chloride, suitable plastic or suitable metals.

At the bottom of the false bottom collecting compartment 50b is an outlet opening 52 through which gray water flows from the false bottom collecting compartment 50b to the flush toilet tank 20 via a conduit 53, the pump 30 and the conduit 22. The conduit 22 serves as common conduit for the flow of gray water from the bathtub collecting compartment 50b and the shower stall collecting compartment 15b. Disposed along the conduit 53 is a one-way check valve 55, which serves to enable gray water to flow toward the toilet flush tank 20, but prevents gray water from backing-up into the false bottom collecting compartment 50b.

Also disposed along the conduit 53 in the vicinity of the outlet opening 52 is a shut-off valve 56. The shut-off valve 56, when closed, interrupts the flow of gray water from the false bottom collecting compartment 50b into the conduit 53. Conversely, when the shut-off valve 56 is opened, gray water from the false bottom collecting compartment 50b can flow from the false bottom collecting compartment 50b through the pump 30 and the conduit 53.

The pump 30 serves, when operated, to pump gray water under pressure from the false bottom collecting compartment 50b to the toilet flush tank 20 over the following path: conduit 53, opened shut-off valve 56,

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check valve 55, pump 30 and conduit 22. The operation of the pump 30 is controlled by water pressure or the pressure head of the water in the conduit 22.

When the water in the flush tank 20 is below a
5 predetermined level, such as a pressure head of 20 p.s.i. in the conduit 22, the pump 30 is operated to pump gray water from the collecting compartment 50b into the flush tank 20. When the water in the flush tank 20 is above a predetermined level, such as a pressure head of 30 p.s.i.
10 in the conduit 22, the operation of the pump 30 is interrupted. The gray water in the flush tank 20 is used to flush the toilet bowl 40 under the control of the flush mechanism 20a.

In the event the water level of the gray water in the
15 false bottom collecting compartment 50b is above a predetermined level, the excess gray water is discharged into a sewer drain pipe 61 through a conduit 62. Should it be desired to discharge the gray water in the false bottom collecting compartment 50b directly into the sewer
20 drain pipe 61, a suitable drain 63 and a drain valve 64 are provided. The drain valve 64 communicates with the sewer drain pipe 61 through an elbow conduit 65. The drain 63, the drain valve 64 and the elbow 65 provide a convenient arrangement for cleaning the compartment 50b.

25 Disposed along the conduit 22 is a suitable shut-off valve 66 and a suitable shut-off valve 67. When the shut-off valve 66 is opened and the shut-off valve 67 is closed, gray water flows through the conduit 22 into the toilet flush tank 20. When the shut-off valve 66 is
30 closed, gray water does not enter the toilet flush tank 20 and the fresh water supply from a water district is used to fill the flush tank 20. In the preferred embodiment, the gray water supply and the fresh water supply are not

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used simultaneously, but, rather, are used separately. When the fresh water supply from a water district is used to fill the flush tank 20, the shut-off valve 66 is closed and the valve 67 is opened. Conversely, when the gray
5 water supply is used to fill the flush tank 20, the shut-off valve 66 is opened and the shut-off valve 67 for the fresh water supply to the flush tank 20 is closed. A removable cover 60 is employed to enable the collecting tank 50 to be cleaned-out periodically.

10 It is contemplated by the present invention that well-known and conventional chemicals for water cleanliness may be added to the false bottom collecting compartments 15b and 50b through the drains 16 and 51, respectively. It is apparent that wash basins can be made
15 with an integrally formed false bottom for supplying gray water for reuse in the flush tank 20 in a manner similar to that described for the shower stall 15 and the bathtub 50. While the arrangement 10 is described as employing both a bathtub collecting compartment 50b and a shower
20 stall collecting compartment 15b, it is apparent that the use of one without the other or the use of both simultaneously falls within the purview of the present invention.

Illustrated in Figure 2 is an arrangement 70 for reusing gray water, which is a modification of the
25 arrangement shown in Figure 1. Components in Figure 2 similar in structure and operation to components shown in Figure 1 will be illustrated with the same reference numeral but with a prime suffix.

The arrangement shown in Figure 2 differs from the
30 arrangement shown in Figure 1 in that rain water received by a downspout 71 from a gutter 69 advances into the false bottom collecting compartment 50b' through a conduit 72. In the preferred embodiment, the downspout 71 is provided

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with suitable wire mesh screens to prevent foreign matter from entering the false bottom collecting compartment 50b'. A suitable clean-out valve 73, illustrated in Figure 2 for cleaning out debris, is disposed along the downspout 71 for cleaning out debris that may clog the passage of rain water or interfere with the operation of the component parts. The clean out valve 73 includes a lower flared female end section 73a that receives a screw-in tubular male section 73b during the collection of rain water in the collecting compartment 50b'. The male tubular section 73b is removed from the female end section 73a for cleaning out the gathered debris. A suitable shut-off valve 71a is disposed in the conduit 72. Should it be desired to collect rain water through the conduit 72, the shut-off valve 71a is opened. Should it be desired to interrupt the flow of rain water through the conduit 72, the shut-off valve 71a is closed.

In a similar manner, rain water received by a downspout 75 from a gutter 74 advances into the false bottom collecting compartment 15b' through a conduit 76. The downspout 75 is provided with suitable wire mesh screens to prevent foreign matter from entering the false bottom collecting compartment 15b'. A suitable clean-out valve 77, illustrated in Figure 2 for cleaning out debris, is disposed along the downspout 75 for cleaning out debris that may clog the passage of rain water or interfere with the operation of component parts. The clean out valve 77 includes a lower flared female end section 77a that receives a screw-in tubular male section 73b during the collection of rain water in the collecting compartment 15b'. The male tubular section 77b is removed from the female end section 77a for cleaning out the gathered debris. In the preferred embodiment, the conduit 76, as

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well as the conduit 72, is disposed at an angle and is directed upwardly and outwardly so that debris will collect at a location accessible to the associated clean-out valve, such as the clean-out valve 77. A

5 suitable shut-off valve 75a is disposed in the conduit 76. Should it be desired to collect rain water through the conduit 76, the shut-off valve 75a is opened. Should it be desired to interrupt the flow of rain water through the conduit 77, the shut-off valve 75a is closed.

10 Illustrated in Figure 3 is an arrangement 90 for reusing gray water, which is a further modification of the arrangement shown in Figure 1. Components in Figure 3 similar in structure and operation to components shown in Figure 1 will be illustrated with the same reference
15 numeral but with a double prime suffix.

The arrangement shown in Figure 3 differs from the arrangement shown in Figure 1 in that a toilet flush tank 91 is disposed contiguous to and laterally outward from a toilet bowl 40". In the exemplary embodiment, the top of
20 the flush tank 91 is generally at even height with the top of the toilet bowl 40" and extends below the toilet bowl 40". The toilet flush tank 91 is both a storage and flush tank combination for the collection of gray water including rain water.

25 A conduit 92 interconnects the bathtub collecting compartment 50b" with the flush tank 91 so that gray water in the bathtub collecting compartment 50b" discharges into the flush tank 91. In a similar manner, a conduit 93 interconnects the shower stall collecting compartment 15b"
30 with the flush tank 91 so that gray water in the shower stall collecting compartment 15b" discharges into the flush tank 91.

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Disposed generally within the flush tank 91 is a foot pedal assembly 95. The foot pedal assembly 95 will be described hereinafter in greater detail with reference to Figures 5 and 6. A foot actuated pedal 95a of the foot pedal assembly 95 projects exteriorly of the flush tank 91. When the water level in the flush tank 91 is above the intake opening of the foot pedal assembly 95, an operator actuating the foot actuated pedal 95a will cause gray water in the flush tank 91 to enter the toilet bowl 40" through a conduit 96 to flush the toilet bowl 40".

In the exemplary embodiment, the flush tank 91 includes an auxiliary section 99 with a removable cover 99a for cleaning the flush tank 91. In the auxiliary section 99 is a suitable water gauge 99b to indicate the level of the gray water in the flush tank 91. Such water gauges may be of the type manufactured and sold as the TEMPO mechanical fuel gauge using a cork and Model TRM-1 direct sight reading capsule. Another suitable gauge is the TELEFLEX XL gauge, Model No. 274993, fuel level gauge.

Communicating with the toilet bowl 40" is a well-known sewage drain pipe DP. An overflow drain pipe 93 is located within the flush tank 91 and communicates with the drain pipe DP to conduct overflow gray water in the flush tank 91 into the drain pipe DP through an elbow 94.

Rain water collecting in a gutter is conducted through a downspout 95 to the flush tank 91 via a conduit 96. An on-off valve 95a is disposed in the conduit 96. Should it be desired to collect rain water through the conduit 96, the shut-off valve 95a is opened. Should it be desired to interrupt the flow of rain water through the conduit 96, the shut-off valve 95a is closed. The rain water in the flush tank 91 is used to flush the toilet bowl 40" in a manner heretofore described for flushing the toilet

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bowl 40" with gray water by means of the foot pedal assembly 95.

It is apparent that the various gray water collecting compartments, such as the compartment 15b" and 50b", can
5 be used separately or in combination.

Likewise, the concept of the arrangement of the flush tank 91 and the toilet bowl 40" lends itself for use separately or in combination with the units embodied in the arrangement 90. The discharge of gray water, which
10 may include rain water, from the flush tank 91 into the toilet bowl 40" for flushing the same will be described in detail in connection with the foot pedal assembly 95 shown in Figures 5 and 6. Should it be desired to use fresh water supplied by a water district, then a suitable
15 conduit and shut-off valve can be connected to the flush tank 91 as shown in Figures 1, 2 and 4.

Illustrated in Figure 4 is an arrangement 110 for reusing gray water, which is a further modification of the arrangement 10 shown in Figure 1. Components in Figure 4
20 similar in structure and operation to components shown in Figure 1 will be illustrated with the same reference number but with a suffix having triple primes.

The arrangement shown in Figure 4 differs from the arrangement shown in Figure 1 in that an integrally formed
25 storage tank 111 is used in addition to the toilet flush tank 20". The storage tank 111 is disposed below the toilet bowl 40" and below the floor F". A conduit 113 interconnects the bathtub collecting compartment 50b" with the storage tank 111 so that gray water in the
30 bathtub collecting compartment 50b" discharges into the storage tank 111. In a similar manner, a conduit 114 interconnects the shower stall collecting compartment 15b" with the storage tank 111 so that gray water in the

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shower stall collecting compartment 15b'" discharges into the storage tank 111.

A downspout and conduit, similar to the arrangement shown in Figure 3, can be employed to supply rain water
5 into the storage tank 111.

Disposed within the storage tank 111 is a well-known pump 115, which pumps gray water from the storage tank 111 into the flush tank 20'". When the pump 115 is operated, the gray water in the storage tank 111 discharges into the
10 flush tank 20'" through a conduit 116. In the exemplary embodiment, the pump 115 is a well-known self-primed, automatic marine/RV potable pump manufactured by Flojet, Model No. 2P366.

When the water in the flush tank 20'" is below a
15 predetermined level, such as a pressure head of 20 p.s.i. in the conduit 116, a built-in pressure switch automatically turns on to pump water from the storage tank 111 into the flush tank 20'". When the water in the storage tank 111 is above a predetermined level, such as a
20 pressure head of 30 p.s.i. in the conduit 116, the built-in pressure switch automatically turns off the pump 115 to interrupt the flow of gray water from the storage tank 111. A suitable level float gauge 117 is disposed in the top wall of the flush tank 20'". Such gauges may be
25 of the type manufactured and sold as the TEMPO mechanical fuel gauge using a cork and model TRM-1 direct sight reading capsule. Another suitable gauge is the TELEFLEX XL gauge, Model No. 274993, fuel level gauge. A suitable overflow drain pipe 112 is connected to a conventional
30 sewer drain pipe DP'" through an elbow 112a.

When fresh water supplied from a water district or the like is used, a suitable shut-off valve 118 is closed to interrupt the supply of gray water from the storage

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tank 111 to the flush tank 20'" and a shut-off valve 119 is opened to supply fresh water from the water district into the flush tank 20'". Conversely, when gray water is used, the shut-off valve 118 is opened to discharge gray water into the flush tank 20'" from the storage tank 111 and the shut-off valve 119 is closed to interrupt the supply of fresh water into the flush tank 20'" from the fresh water supply.

The water in the flush tank 20'" is used to flush the toilet bowl 40'" under the control of a flush mechanism 150. Disposed generally within the flush tank 20'" is the manually operated flush mechanism 150 which may be used in lieu of the manually operated flush tank mechanism shown in Figure 1. The flush mechanism 150 will be described hereinafter in greater detail with reference to Figure 7. A handle 163 of the flush mechanism 150 is disposed exteriorly of the flush tank 20'". Actuation of the handle 163 by an operator will cause water in the flush tank 20'" to enter the toilet bowl 40'" through a conduit 152 to flush the toilet bowl 40'" in a manner to be described herein in connection with Figure 7.

The collector compartment 50b'" is modified to include a removable cover 107 to gain access to the gray water collecting compartment 50b'". At the bottom wall of the gray water collecting compartment 50b'" is a suitable drain valve 108 with a handle 108a. For cleaning out the gray water collecting compartment 50b'", an operator temporarily opens the drain valve 108 through the handle 108a to enable the gray water and a cleansing liquid to discharge into the sewer drain pipe DP'". In a similar manner, the storage tank 111 includes a removable cover 109 to gain access to the interior of the storage tank 111. A suitable drain valve 109a is disposed in the bottom wall of the flush tank 111 and communicates with

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the sewer drain pipe DP'" through an elbow 109b. The drain valve 109a has a handle 109c. For cleaning out the flush tank 111, an operator temporarily opens the drain valve 109a through the handle 109c to enable the gray
5 water and a cleansing liquid to discharge into the sewer drain pipe DP'".

Illustrated in Figures 5 and 6 is the foot pedal assembly 95 for the arrangement shown in Figure 3. When the water level in the flush tank 91 is above the intake
10 opening of the foot pedal assembly 95, an operator actuating the foot pedal 95a will cause gray water in the flush tank 91 to enter the toilet bowl 40" through the conduit 96 to flush the toilet bowl 40".

Toward this end, the foot pedal assembly 95 comprises
15 a cylindrical vessel 125 which is disposed within the flush tank 91 in the vicinity of the bottom wall of the flush tank 91. The vessel 125 has an open top 125a for the intake of gray water. The bottom of the vessel 125 is closed except for an outlet opening 125b, which is in
20 communication with the conduit 96. The conduit 96 conducts gray water into the toilet bowl 40" to flush the same.

Disposed within the vessel 125 is an annular valve seat 126. A valve head 127 is removably disposed on the
25 valve seat 126. In the exemplary embodiment, the valve head 127 is made of metallic disc plates with a tapered rubber layer sandwiched therebetween. In the exemplary embodiment, the valve seat 126 is made of metal. Attached to the bottom wall of the valve seat 126 is a suitable rod
30 128, which serves to raise and lower the valve head 127. Suitable braces 129 support the rod 128 for reciprocal movement within the vessel 125.

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Exteriorly of the flush tank 91 is disposed the foot pedal 95a actuated for seating and unseating the valve head 127 relative to the valve seat 126. For this purpose, the rod 128 projects outside of the flush tank 91. Suitable O-rings 131 provide a seal against gray water leakage between the bottom wall of the flush tank 91 and the foot pedal assembly 95. The lower end of the rod 128 is attached to the cross member of a yoke 132. The free ends of the legs of the yoke 132 are attached respectively to the distal ends of an axle of a roller 135. The roller 135 supports the yoke 132 for vertical rectilinear movement.

The foot pedal 95a is formed with a lever arm 136 over which the roller 135 travels. The roller 135 is formed with a circumferential groove which receives the lever arm 136. The lever arm 136 is supported for pivotal movement by legs 137 by means of a pivot pin 138. Spaced from the legs 137 toward the free end of the lever arm 136 is an H-shaped guide member 140. The upstanding legs of the guide member 140 guide the lever arm 136 in its vertical pivotal movement. The cross arm of the guide member 140 limits or stops the downward movement of travel of the lever arm 136. Integrally formed with the lever arm 136 is the foot pedal 95a. A compression coil spring 141 is disposed between the O-ring 131 and the yoke 132. The rod 128 is received by the compression coil spring 141. In the operation of the foot pedal assembly 95, an operator actuates the foot pedal 95a for downward movement. This action results in the lever arm 136 being elevated. As a consequence thereof, the roller 135 is raised to lift the rod 128. The lifting of the rod 128 unseats the valve head 127 from the valve seat 126. Gray water flows from the flush tank 91 (Figure 3) into the toilet bowl 40" to flush the same.

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When the operator releases the foot pedal 95a, the rod 128 is lowered under the urgency of the spring 141 to seat the valve head 127 onto the valve seat 126 to interrupt the flow of gray water from the flush tank 91.

- 5 Simultaneously therewith, the roller 135 urges the lever arm 136 downwardly until it engages the crossarm stop of the guide member 140. The foot pedal 95a is now raised to its normal position.

- 10 Illustrated in Figure 7 is the manually operated flushing assembly 150 for the discharge of water from the flush tank 20'' (Figure 4) into the toilet bowl 40'' for the flushing of the same. It is intended that the manually operated assembly 150 may be employed in lieu of the conventional manually operated assemblies, such as
- 15 manually operated assembly 20a shown in Figure 1, for the discharge of water from the flush tank into the toilet bowl for flushing of the same. It is also intended that the manually operated assembly 150 may be employed in lieu of foot pedal assembly 95 shown in Figure 3.

- 20 The manually operated assembly 150 comprises a cylindrical vessel 151 disposed in the vicinity of the bottom wall of the flush tank 20''. The axial height of the cylindrical vessel is relatively small so as to be adaptable to receive water to be discharged into the
- 25 toilet bowl 40'' at the lowermost level within the flush tank 20''. The bottom of the vessel 151 is closed except for a discharge opening at the conduit 152 which communicates with the toilet bowl 40'' for the discharge of water therein for flushing the same. The top of the
- 30 vessel 151 is opened for the passage of water into the vessel 151. Thus, water in the flush tank 20'' passes through the opening at the top of the vessel 151 and is discharged through the outlet opening at the conduit 152 for passage into the toilet bowl 40''.

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Disposed within the vessel 151 is an annular valve seat 153, which, in the exemplary embodiment is made of metal. Removably seated on the valve seat 153 is a valve head 154. In the preferred embodiment, the valve head 154 is made of metallic disc plates with a tapered rubber layer sandwiched therebetween. Extending upwardly from the valve seat 154 is a vertical rod 155. The lower end of the rod 155 is fixed to the top end of the valve head 154 so as to raise and lower the same over a vertical rectilinear path.

Vertically spaced braces 156-158 with annular guide members 156a-158a, respectively, support and guide the rod 155 for rectilinear movement over a vertical path. The guide rod 155 is received by the annular guide members 156a-158a for rectilinear movement over a vertical path.

The upper end of the rod 155 is connected to the free end of an arm 160 by means of a chain 161. The proximal end of the arm 160 is fixed to a pin 162 for rotation therewith. The pin 162 is supported for rotation by the adjacent side wall of the flush tank 20". Fixed to the pin 162 is the handle 163, which is located exteriorly of the flush tank 20". Downward movement of the handle 163 rotates the pin 162 to impart an upward movement to the arm 160.

A tension coil spring 165 is disposed below the fixed annular guide member 157a of the brace 157 and an anchor annular member 166 fixed to the rod 155. The action of the spring 165 continuously urges the valve head 154 to seat on the valve seat 153.

In the operation of the manually operated assembly 150, an operator moves the handle 163 downwardly to discharge water from the flush tank 20" into the toilet bowl 40" (Figure 4). The lowering of the handle 163

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serves to raise the free end of the arm 160. In turn, the chain 161 is raised to lift the rod 155 upwardly. This action raises the valve head 154 from the valve seat 153 against the urgency of the spring 165 to discharge water
5 from the flush tank 20'" into the toilet bowl 40'".

The release of the handle 163 by the operator enables the spring 165 to urge the rod 155 downwardly. As a consequence thereof, the valve head 154 seats on the valve seat 153 to interrupt the flow of water from the flush
10 tank 20'" into the toilet bowl 40'". The lowering of the rod 155 also causes the chain 161 to lower the free end of the arm 160, which, in turn, raises the handle 163 to its initial position.

In times of water shortages, the operator can control
15 manually or by a foot pedal the amount of water required to flush the toilet bowl.

While the various components are shown in combination, it is within the purview of the present invention that the various components such as the bathtub 50, the shower
20 stall 15, the flush tank 91 and the storage tank 111 may be employed respectively as self-contained units or may be employed in combination with one or more other components.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. An arrangement for the reuse of gray water to flush a toilet bowl comprising:
 - (a) a flush tank for the toilet bowl;
 - (b) a bathtub having a bathing section with a bottom wall and a bathtub collecting compartment contiguous with and disposed below said bathing section, said bathtub further comprising a drain in the bottom wall of said bathing section for gray water to drain from said bathing section into said bathtub collecting compartment; and
 - (c) means interconnecting said bathtub collecting compartment with said flush tank for discharging gray water into said flush tank.
2. An arrangement as claimed in claim 1 wherein said bathtub collecting compartment is integrally formed with said bathing section.
3. An arrangement for the reuse of gray water to flush a toilet bowl comprising:
 - (a) a flush tank for the toilet bowl;
 - (b) a shower stall having a shower bath section with a bottom wall and a shower stall collecting compartment contiguous with and disposed below said shower bath section, said shower stall further comprising a drain in the bottom wall of said shower bath section for gray water to drain from said shower bath section into said shower stall collecting compartment; and
 - (c) means interconnecting said shower stall collecting compartment with said flush tank for discharging gray water into said flush tank.

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4. An arrangement as claimed in claim 3 wherein said shower stall collecting compartment is integrally formed with said shower bath section.

5. An arrangement for the reuse of gray water as claimed in claim 1 and further comprising:

(a) a shower stall having a shower bath section with a bottom wall and a shower stall collecting compartment contiguous with and disposed below said shower bath section, said shower stall further comprising a drain in the bottom wall of said shower bath section for gray water to drain from said shower bath section into said shower stall collecting compartment; and

(b) a conduit interconnecting said shower stall collecting compartment with said means for discharging gray water into said flush tank.

6. An arrangement as claimed in claim 1 and comprising a construction floor generally at even height with said bottom wall of said bathtub for concealing the presence of said bathtub collecting compartment.

7. An arrangement as claimed in claim 3 and comprising a construction floor generally at even height with said bottom floor of said shower stall for concealing the presence of said shower stall collecting compartment.

8. An arrangement as claimed in claim 1 and comprising means for collecting rain water; and a conduit for interconnecting said means for collecting rain water and said bathtub collection compartment for discharging rain water into said bathtub collecting compartment.

9. An arrangement as claimed in claim 1 and comprising means for collecting rain water; and a conduit for interconnecting said means for collecting rain water and said shower stall collecting compartment for discharging rain water into said bathtub collecting compartment.

10. An arrangement as claimed in claim 1 comprising a pump responsive to the level of water in said flush tank for pumping gray water through said means interconnecting said bathtub collecting compartment into said flush tank in response to the water level in said flush tank being lowered below a first predetermined level, the pumping of water into said flush tank by said pump being interrupted in response to the water level in said flush tank being raised above a second predetermined level.

11. An arrangement as claimed in claim 3 and comprising a pump responsive to the level of water in said flush tank for pumping gray water through said means interconnecting said shower stall collecting compartment with said flush tank in response to the water level in said flush tank being lowered below a first predetermined level, the pumping of water into said flush tank by said pump being interrupted in response to the water level in said flush tank being raised above a second predetermined level.

12. A bathtub comprising:

- (a) a bathing section with a bottom wall;
- (b) a bathtub gray water collecting compartment contiguous with and disposed below said bathing section; and

- (c) a drain in the bottom wall of said bathing section for gray water to drain from said bathing section into said bathtub gray water collecting compartment.

13. A bathtub as claimed in claim 12 wherein said bathtub gray water collecting compartment is integrally formed with said bathing section.

14. A shower stall comprising:

(a) a shower bath section with a bottom wall;
(b) a shower stall gray water collecting compartment contiguous with and disposed below said shower bath section; and

(c) a drain in the bottom wall of said shower bath section for gray water to drain from said shower bath section into said shower stall gray water collecting compartment.

15. A shower stall as claimed in claim 14 wherein said shower stall gray water collecting compartment is integrally formed with said shower bath section.

16. An arrangement for the reuse of gray water as claimed in claim 1 and comprising a toilet bowl, and wherein said flush tank is disposed adjacent to and laterally from said toilet bowl, said arrangement further comprising means for the passage of gray water from said flush tank into said toilet bowl for flushing said toilet bowl.

17. An arrangement for the reuse of gray water as claimed in claim 16 and further comprising operator controlled means for controlling the flow of gray water from said flush tank, through said conduit means and into said toilet bowl.

18. An arrangement for the reuse of gray water as claimed in claim 1 wherein said flush tank is disposed below said toilet bowl, said arrangement further comprises conduit means for the passage of gray water from said flush tank into said toilet bowl for the flushing of said toilet bowl.

19. An arrangement for the reuse of gray water as claimed in claim 18 and further comprising an operator controlled assembly disposed generally within said flush tank and having an operator actuated member disposed exteriorly of said flush tank for controlling the flow of gray water from said flush tank through said conduit means and into said toilet bowl.

20. An arrangement for the reuse of gray water as claimed in claim 3 wherein said flush tank is disposed adjacent to and laterally from said toilet bowl, said arrangement further comprising conduit means for the passage of gray water from said flush tank into said toilet bowl for flushing said toilet bowl.

21. An arrangement for the reuse of gray water as claimed in claim 20 and further comprising an operator controlled assembly disposed generally within said flush tank and having an operator actuated member disposed exteriorly of said flush tank for controlling the flow of gray water from said flush tank, through said conduit means and into said toilet bowl.

22. A toilet assembly comprising:

- (a) a toilet bowl;
- (b) a flush tank disposed adjacent to and laterally from said toilet bowl; and
- (c) means communicating with said toilet bowl and said flush tank for flushing said toilet bowl with a liquid.

23. A toilet assembly as claimed in claim 22 wherein said means includes operator actuated means disposed partially within said flush tank and partially exteriorly of said flush tank for controlling the flow of liquid from said flush tank to said toilet bowl.

24. A toilet bowl assembly comprising:

- (a) a toilet bowl with a top wall;
- (b) a flush tank disposed adjacent to said toilet bowl and below the top of said toilet bowl; and
- (c) means within said flush tank communicating with said toilet bowl and said flush tank for flushing said toilet bowl with a liquid.

25. A toilet assembly as claimed in claim 29 wherein said means includes operator actuated means disposed partially within said flush tank and partially exteriorly of said flush tank for controlling the flow of liquid from said flush tank to said toilet bowl.

26. An arrangement as claimed in claim 1 and comprising a toilet bowl and wherein said means includes a storage tank disposed below said toilet bowl.

27. An arrangement as claimed in claim 26 and comprising a pump disposed in said storage tank for pumping water through said means into said flush tank.

28. An arrangement as claimed in claim 3 and comprising a toilet bowl and wherein said means includes a storage tank disposed below said toilet bowl.

29. An arrangement as claimed in claim 28 and comprising a pump disposed in said storage tank for pumping water through said means into said flush tank.

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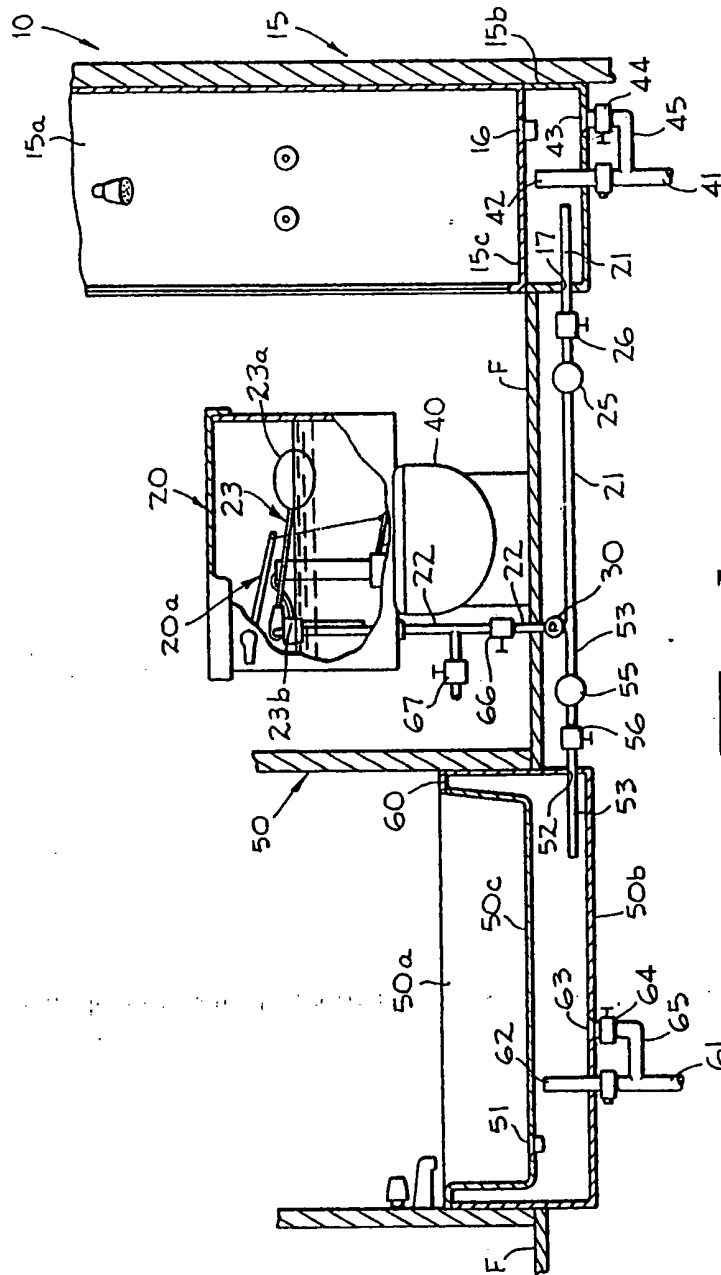


FIG. 1

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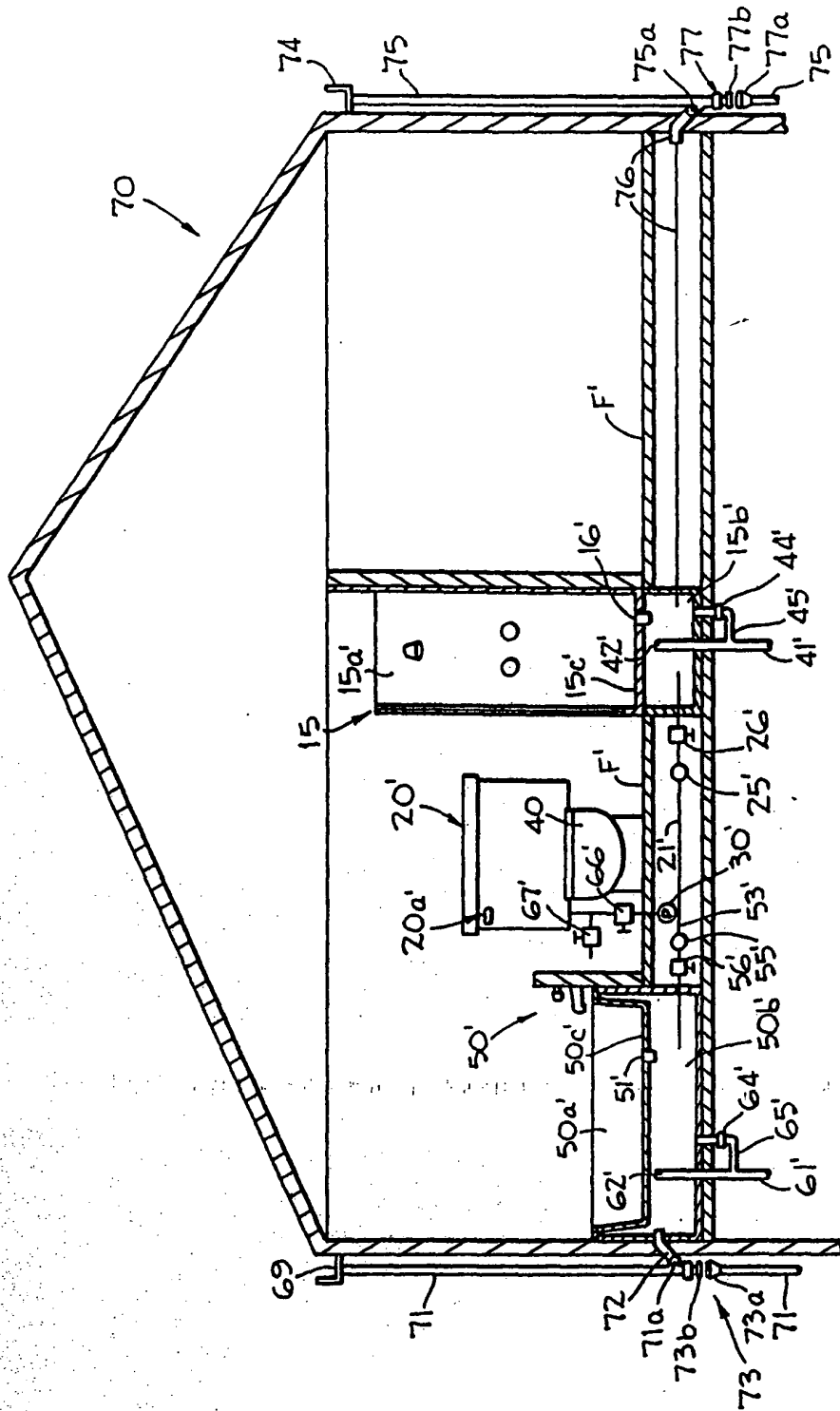


FIG. 2

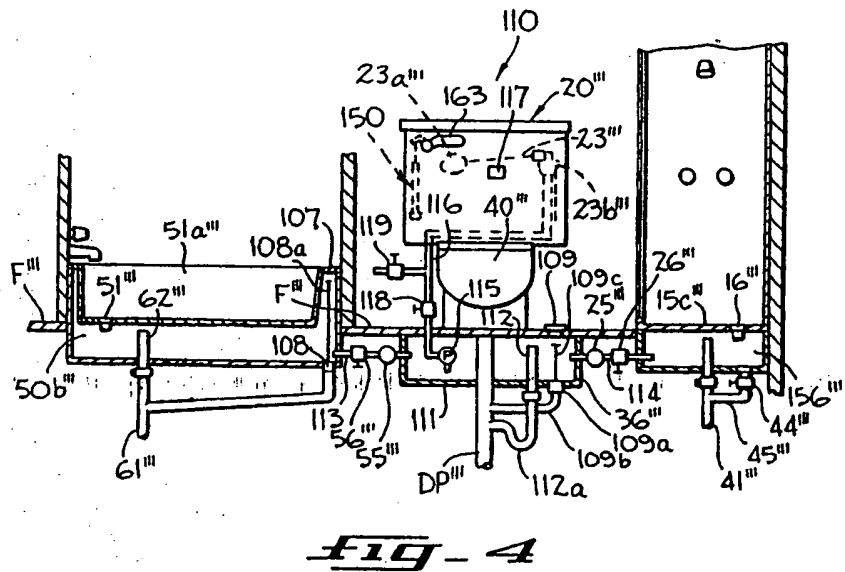
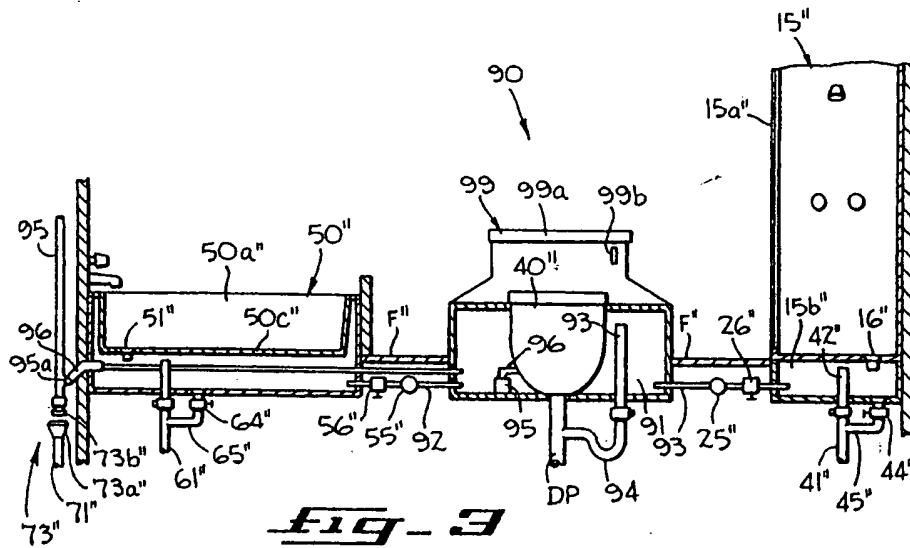


Fig. 5

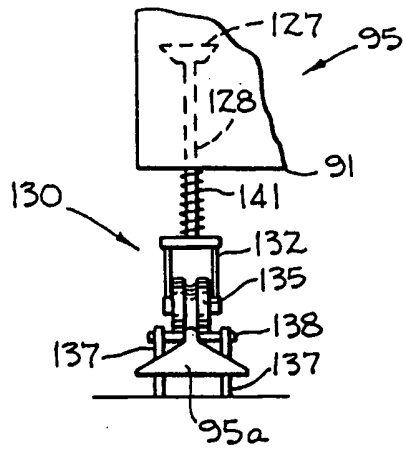


Fig-6

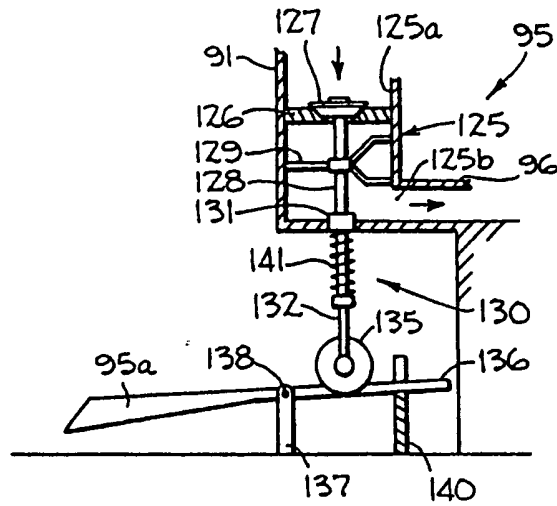
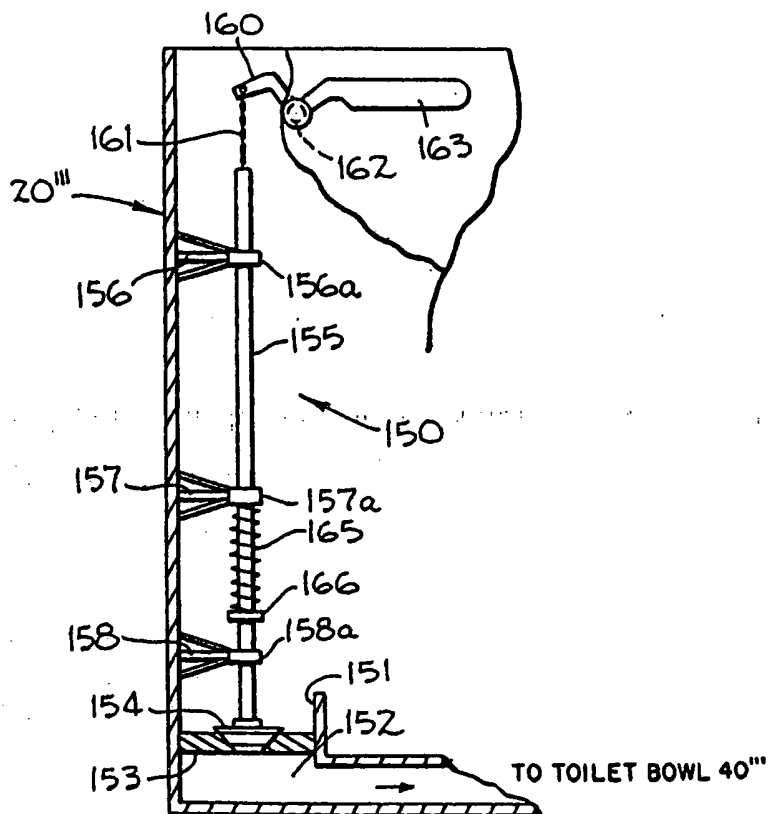


Fig-7



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